US EPA's Science-Based Approach to Understanding and Managing Environmental Risk from PFAS

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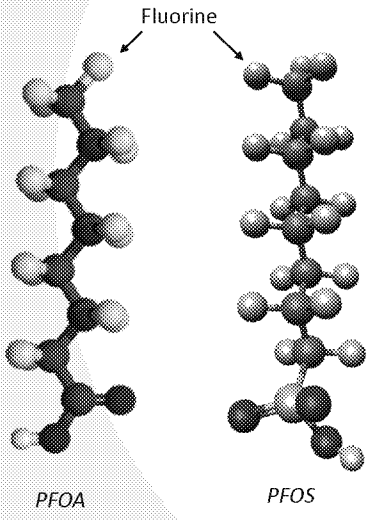
Per- & Polyfluoroalkyl Substances (PFAS)



- **A class of man-made chemicals**
  - **Chains** of carbon (C) atoms surrounded by fluorine (F) atoms, with different terminal ends
  - **Complicated chemistry** – thousands of different variations exist in commerce
  - **Widely used** in industrial processes and in consumer products
  - **Some** PFAS are known to be **PBT**:
    - **Persistent** in the environment
    - **Bioaccumulative** in organisms
    - **Toxic** at relatively low (ppt) levels

EPA PFAS Action Plan

- **Drinking Water** – The EPA is committed to following the MCL rulemaking process as established by SDWA. EPA will propose a regulatory determination for PFOA and PFOS by the end of this year, and propose nationwide drinking water monitoring for PFAS under the next UCMR monitoring cycle.
- **Cleanup** – Initiating the regulatory process for designating PFOA and PFOS as Hazardous Substances, set interim groundwater cleanup recommendation
- **Toxics** – Consider including PFAS in Toxics Release Inventory (TRI), initiate proposal to prohibit the uses of certain PFAS chemicals through the TSCA new chemicals program
- **Research** – Rapidly expand scientific foundation for understanding and managing PFAS risk
- **Enforcement** – Use enforcement tools, where appropriate, to address PFAS exposures in the environment and assist states in enforcement activities
- **Risk Communications** – Work with partners to develop a risk communication toolbox to support federal, state, tribal, and local partners for communicating with their constituents

PFAS Action Plan - Research

- The EPA is rapidly expanding the scientific foundation for understanding and managing risk from PFAS.
- This research is organized around:
  - understanding **toxicity**
  - understanding **exposure**
  - assessing **risk**
  - identifying effective **treatment and remediation** actions

Research – Human Health

- **Problem**: Lack of human toxicity information for many PFAS of interest
- **Action**: 2-prong strategy
  - Develop standard toxicity assessments (e.g. IRIS) where data are available
  - Use in vitro, high throughput screening approaches to fill in gaps
- **Results**:
  - Initial search of published toxicity data for 31 PFAS of interest, ~21 have data
  - Draft toxicity assessments available for HFPO-DA (GenX) and PFBS
  - Draft IRIS assessments underway for PFBA, PFHxS, PFHxA, PFNA and PFDA
  - Seven sets of high throughput assays underway for 150 PFAS representative of chemical space to support prioritization for further tox testing, chemical grouping, read across, relative toxicity and mixtures assessment
- **Impact**: Stakeholders will have PFAS toxicity information to inform risk management decisions and risk communication

Research – Ecological Toxicity

- **Problem**: Lack of ecological toxicity information for PFAS of concern
- **Action**:
  - Systematic review of literature, assembled in the ECOTOX database
  - Developing research plan including identification of sensitive taxa, bioaccumulation, benchmarks, and thresholds
  - Use Adverse Outcome Pathways (AOP) as organizational framework
- **Results**:
  - Ecotoxicity data for ~60 PFAS obtained and collated in public ECOTOX system
  - Research getting underway
- **Impact**: Stakeholders will have PFAS ecotoxicity information to support risk management decisions and risk communication

Research – Analytical Methods

- **Problem**: Lack of standardized/validated analytical methods for measuring PFAS
- **Action**: Develop and validate analytical methods for detecting, quantifying PFAS in water, air, and solids
- **Results**:
  - Updated analytical Method 537.1 for drinking water which includes 4 additional PFAS (18 total, including HFPO-DA and ADONA)
  - Developing new DW Method for ~26 PFAS including shorter chains
  - Developing and testing Direct Injection and Isotope Dilution methods for 24 PFAS in surface water, ground water, soils, sediments, and biosolids
  - Developing methods for air emission sampling and analysis
  - Continued development of HR mass spec methods to discover unknown PFAS
- **Impact**: Stakeholders will have reliable analytical methods to test for known and new PFAS in water, solids, and air

Research – Exposure

- **Problem**: Lack of knowledge on sources, site-specific concentrations, fate and transport, bioaccumulation, and human and ecological exposure
- **Action**: Develop and test methods, models, and databases to characterize PFAS sources and exposures
- **Results**:
  - Developing exposure models for identifying, quantifying PFAS sources, fate and transport pathways, and exposures
  - Developing and evaluating sampling and site characterization approaches to identify sources and extent of contamination
- **Impact**: Stakeholders will be able to identify and assess potential PFAS sources and exposures, and identify key pathways for risk management

Research – Drinking Water Treatment

- **Problem**: Lack of water treatment technology performance and cost data for PFAS removal
- **Action**:
  - Review PFAS performance data from available sources (industry, DoD, academia, international)
  - Test commercially available granular activated carbons (GACs) and ion exchange (IX) resins for effectiveness over a range of PFAS under different water quality conditions
  - Evaluate a range of system sizes – large full-scale utility options to home treatment systems
- **Results**:
  - EPA's **Drinking Water Treatability Database** updated for 22 PFAS, including HFPO-DA (GenX chemicals), 6:2 and 8:2 FTS, and PFAS of 4 to 13 C chain length
  - Use state-of-the-science models to extrapolate existing treatment studies to other conditions
- **Impact**: Utilities will be able to identify cost effective treatment strategies for removing PFAS from drinking water

Research – Contaminated Site Remediation

- **Problem**: PFAS-contaminated sites require remediation and clean up to protect human health and the environment
- **Action**:
  - Characterize PFAS sources such as fire training/emergency response sites, manufacturing facilities, production facilities, disposal sites
  - Evaluate technologies for remediating PFAS-impacted soils, waters, and sediments
  - Generate performance and cost data with collaborators to develop models and provide tools to determine optimal treatment choices
- **Results**: Tools, data and guidance regarding cost, efficacy, and implementation for remedy selection and performance monitoring
- **Impact**: Responsible officials will know how to reduce risk of PFAS exposure and effects at contaminated sites, and to repurpose sites for beneficial use

Research – Materials Management

- **Problem**: Lack of knowledge regarding end-of-life management of PFAS-containing consumer and industrial products
- **Action:**
  - Characterize end-of-life PFAS disposal streams (e.g. municipal, industrial, manufacturing, recycled waste streams)
  - Evaluate efficacy of materials management technologies (e.g. landfilling, incineration, composting, stabilization) to manage end-of-life disposal
  - Evaluate performance and cost data with collaborators to manage these materials and avoid environmental PFAS releases
- **Results**: Provide technologies, data and tools to manage end-of-life streams
- **Impact**: Responsible officials will be able to manage effectively end-of-life disposal of PFAS-containing products

Technical Assistance

- **Problem**: State, tribes and communities often lack capabilities for managing PFAS risk
- **Action:**
  - Make EPA technical staff available to consult on PFAS issues
  - Utilize applied research while also providing technical support to site managers
  - Summarize and share lessons learned from technical support activities
- **Results**: Many examples of past and ongoing technical assistance
  - Cape Fear River, NC – Significant reductions in PFAS in source and finished water
  - Manchester, NH – Collaboration on air and water sampling
  - Oscoda, MI – Advice on foam sampling and dermal exposure risk on a recreational lake
- **Impact**: Enable states, tribes and communities to 'take action on PFAS'

Collaboration

PFAS is a topic of interest to many different organizations, and EPA is committed to leveraging partnerships and collaborations to achieve results. Some examples:

- Collaborating with the National Toxicology Program (NTP) on high throughput toxicology testing
- Collaborating with DOD on analytical method development, treatment/remediation approaches, and participation in the Strategic Environmental Research and Development Program (SERDP)
- Collaborating with individual states and public utilities in testing and applying PFAS measurement and treatment methods
- Collaborating with the academic community via EPA's Science to Achieve Results (STAR) competitive grant program

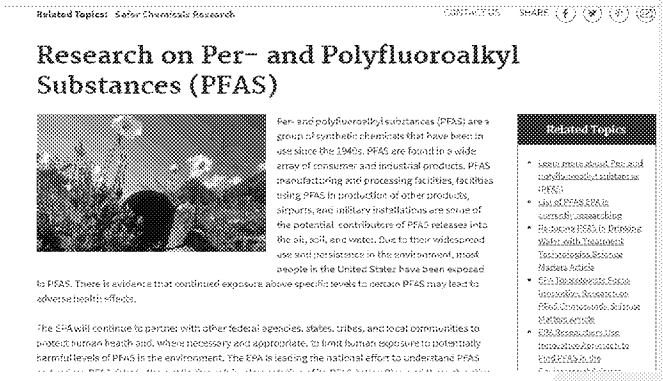
Possible EPA-FDA Common Interests

- Share information about analytical methods for different media of interest – water, soil, food products, solid materials
- EPA use of published data from food surveys to inform human PFAS exposure models
- EPA-USDA PFAS in Agriculture initiative
- Others?

EPA PFAS Data and Tools

- Links to data and tools that include information related to PFAS and are available on EPA's website:

https://www.epa.gov/pfas



Related Topics: Safer Chemicals Research

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Research on Per- and Polyfluoroalkyl Substances (PFAS)

Per- and polyfluoroalkyl substances (PFAS) are a group of synthetic chemicals that have been in use since the 1940s. PFAS are found in a wide array of consumer and industrial products. PFAS manufacturing and processing facilities, facilities using PFAS in production of other products, airports, and military installations are some of the potential contributors of PFAS releases into the air, soil, and water. Due to their widespread use and persistence in the environment, most people in the United States have been exposed to PFAS. There is evidence that continued exposure above specific levels to certain PFAS may lead to adverse health effects.

The EPA will continue to partner with other federal agencies, states, tribes, and local communities to protect human health and, where necessary and appropriate, to limit human exposure to potentially harmful levels of PFAS in the environment. The EPA is leading the national effort to understand PFAS

Related Topics

- Learn more about Per- and polyfluoroalkyl substances (PFAS)
- List of PFAS EPA is currently researching
- Response: PFAS in Drinking Water with Treatment Technologies Science Matters Article
- EPA Technologies Spurs Innovation: Research on PFAS Chromatography Software Matters article
- EPA Researchers Use Innovative Approach to Find PFAS in the

https://www.epa.gov/chemical-research/research-and-polyfluoroalkyl-substances-pfas

For More Information

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